


Accessing Wheelchair Functions and Assistive Technology Through the Driver Control

.15 ceu
2012 Invacare CARES
Education Series
Presented by: Joe Schumacher



Objectives

- List the steps involved in programming ECU and other AT through the wheelchair electronics.
- Identify the process by which an individual can change from driving mode to other modes to control communication devices, computers and power seating with a three or four quadrant system.
- State two options to determine what feature the individual is accessing through the power wheelchair electronics.
- State at least 2 methods to customize power seat functions in a 3 quadrant system.



Before anything else.....

Positioning = Access = Function



Clinical Considerations for PMD Electronics



- Independent drive profiles
 - Set differently for environmental demands
- Use of multiple drive control inputs
- Accessing features of the wheelchair using head control
- Importance of auditory feedback

Assigning Modes



How many activities can you place into one Drive Profile???

- Driving
- Power Seating
- Automatic Positioning/ Memory Seating
- Drive Selection: 1, 2, 3, 4, etc.
- Environmental Controls
 - TV, VCR, Stereo, Lights, Intercom, Door Opener, Call for Caregiver...
- Computer Access / Internet Access / E-mail
- Augmentative Communication, i.e., SGD's
- Rim Driving

5

Accessing Features Through Alternative Controls



- Wheelchair electronics provide access and control of the chair's features and accessories
 - E.g., drive, tilt, recline, communication devices
- Features are accessed through menus via drive control system



Hardware: Interface Modules



MKBi Mouse/IR Module



ASL Digital Interface



mouse computer

7

Switches

Bypassing switches is a Great Feature when required... But...
Many just want to "Hit a Switch" & Gidder Done...

2 Egg Switches Mounted With Custom Bracket



8


Switch Assessment

Location...Location...Location...

- Sustained v/s Momentary Activation
- Pressure (Mechanical) v/s Movement (Electrical)
- Quick Release v/s Relaxed Release
- Quick Activation v/s Relaxed Activation




Access

Switch Assessment 

1. Awareness
2. Active Range of Motion
3. Control / Coordination
4. Muscle Strength
5. Dexterity
6. Muscle Tone
7. Reflexive Patterns / responses

10

Switch Assessment 

Looking for Repeatable - Controlled – Voluntary - Movements

- isolated
- non-reflexive
- not part of a pattern of movement


Adequate Range of Motion

- Limitations to active range of motion
- Ataxia / SOME movement disorders
 - try switch placement at end ranges

Muscle tone

- What is the definition of “Normal Muscle Tone”
- High – Avoid Midline?
- Low – Consider Midline? / Consider Proximal Placement
- Fluctuating Tone – The hardest to address...

11

Switch Assessment 

Strength

- for adequate movement
- for repeated movement
- for sustained pressure
- Clients with muscle weakness usually do better with midline and proximal placement

Try to avoid placing switch in line of a reflex pattern

Try Very Hard to avoid placing a switch at the end range of a reflexive pattern. (Release)

12

Switch Site Hierarchy



1. Hand
2. Head
3. Mouth
4. Upper Extremity
5. Lower Extremities
6. Foot
7. ???

13

Switches Plug into Driver Control



Three Functions Available:

1. Mode Switch
2. Drive Select Switch
3. Actuator Switch

To program a Single function:
Calibrations Menu • Mono Port 1

If Two Functions are required,
(Two Switches), add "Y" Cable
(Splitter)

Calibrations Menu • Mono Port 1
• Mono Port 2



Dedicated for use with a
Remote On/Off switch



"Y" Splitter



Stereo
Switches

14

Switch Functions



1. As a Driver Control
2. To change Forward/Reverse (RIM Driving)
3. To change speeds when using "3 Speed Dig"
4. To Operate Powered Seating (Tilt or Recline)
5. As a Safety "Stop" Switch
6. As a Reset Switch to change modes
7. To Turn the Chair On or Off
8. To wake a chair up after it enters "Stand-By Mode"
9. To Change / Access Drive Profiles (Drive Select)

15

Multi-Switch Interface

Ablenet & ASL



An adapter with five 1/8" phono plug ports. Allows use of ANY 4 switches, mechanical or electrical, to be used for the 4 directional quadrants and ANY fifth switch to be used as the reset switch.


Used when specific or varied switch selections needs to be combined with specific or varied switch locations to allow successful access.

APPLICATION ?

16

Standby Select

- Enhanced by added RIM as a mode.
- Eliminates the need for a Drive for driving only (Regular and RIM) and another Drive for Power Seating. Now each drive can have Driving, RIM driving, Power Seating control, ECU control, etc.
- A True Drive-Only control for all operations. Great for Head Control Users.



"May We Take Your Order"

17

Scan Mode




➤ 3 Scanning Options for access

- Modified Row Column
 - Based from Standard View
- Enhanced Scanning
 - Based from Enhanced View
- Sequential Scanning
 - Largest Icons available - One at a time.

Column/Row View

18


Scan Mode



- View one drive at a time with enlarged icons
- Active Icon / Mode becomes Enlarged
- Additional Programmed features for that drive shown on Right Side

Enhanced View

Scan Mode



- View one Mode / Icon at a time with enlarged View
- All Icons in Scan Drives appear one at a time
- Scanned Drive appears in upper right for reference
- To turn scanning Off in a drive, Select "OFF" in View/Scan menu option of Performance Adjustments

Sequential Scanning

Single Switch Scanner





Driver Control

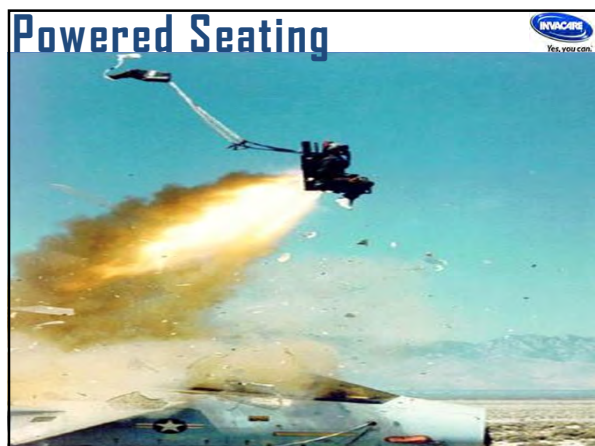


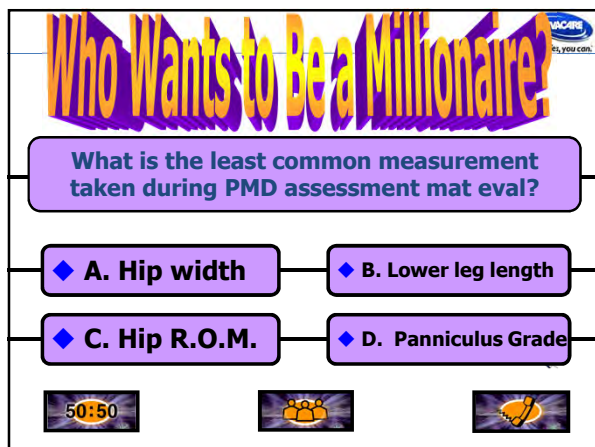


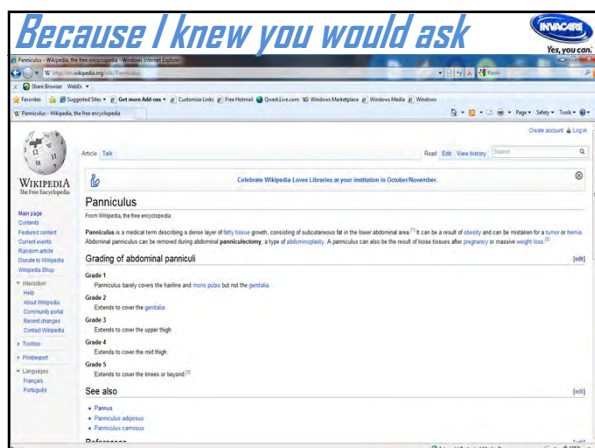
Auditory Feedback

- The Audible Indicator feature of the stand alone MKB Display (ASLRDYM6) is also available with the Color MPJ+ joystick.
- This can be accessed in the CALIBRATIONS Menu of the Hand Held Programmer.








Who Wants to Be a Millionaire?

◆ C. Hip R.O.M.

The hip range of motion is the most often overlooked measurement taken during a mat evaluation for a Power Mobility Device. This measurement or lack thereof is the single greatest contributor to poor positioning within the seating system particularly when the system is not dynamic or the limit angles have not been set.

[Back to Board](#)

Powered Seating Icons



- New Icons draw a 2-D Image of the Seat.
- Assigned Actuator is colored in for each quadrant.
- <4SW>: Actuator Control programming allows user ability to quickly enter ANY actuator mode required

Example shows:
 Forward = Tilt Up/Down
 Reverse = Recline & Legs U/D
 Left = Elevate U/D
 Right = Legs U/D

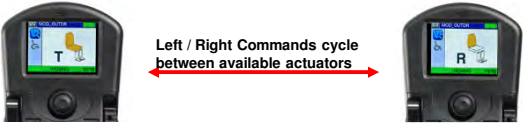
Powered Seating Icons


Directional Arrows for Powered Seating are either Red or Green
 Green moves into a position for driving
 Red moves into a position away from driving
 (No Arrows = Toggles between up/down)



Powered Seating Choice

- <CAPS> gives options for accessing powered seating actuators
- Programmed under <POWERED SEATING> <ACTUATOR CONTROL>





In Any Actuator mode:

Forward Command operates actuator toward Upright.


Reverse Command operates actuator Back.

In RIM (3 quadrant) mode, Left Command cycles through Options, Right Command operates actuator in Toggle Mode.


Powered Seating

Single Actuator Systems

Non-Expandable Driver Control




Expandable Driver Control




Multiple Actuator Systems

Expandable Driver Control




Only 3 Scenarios for Powered Seating Through Driver Control


REPLACE SPJ+ with SPJ+ w/ ACC (E231D)




Add a Sanode to the System (E231D)




REPLACE 4WSB with 34WSB (Multiple Actuator Interface Box) (E231I)



The Right Box for the Job



4-Way Switch Box



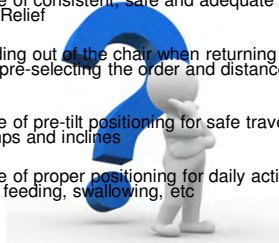
Multiple Actuator Interface Box


Multiple Actuator Systems



Automatic Positioning: Applications 

- Assurance of consistent, safe and adequate positioning for Pressure Relief
- Inhibit sliding out of the chair when returning to upright sitting by pre-selecting the order and distance actuators move.
- Assurance of pre-tilt positioning for safe travel up and down ramps and inclines
- Assurance of proper positioning for daily activities such as transfers, feeding, swallowing, etc



*Infrared Module
&
Wireless RF Mouse Control* 

36

Simplicity is the Key!



- **Simple operation for the User!**
 - Basic IR Control Functions
 - Supports 4-Quadrant (Joystick) and 3 Quadrant (Head Control users.
 - Head Array users can tilt back and still have access to all IR Features
- **Simple programming set-up for the Provider**
 - No Computer required for set-up / programming
 - Use Remote Programmer (MK5 or MK6i) or Pro SD Card
 - Even Basic SD card will allow IR Set-up
 - Enable IR devices by entering device codes or learn commands
- **Limited to 6 IR devices**
 - Easy access to many important IR devices

37

Infrared v/s Radio Frequency



- **Infra-red Signals:**
 - Line of sight Only
 - Can not penetrate walls / obstacles
 - Can be reflected
- **Radio Frequency Signals:**
 - wireless communication protocol
 - Distance limited by strength of signal
 - Penetrate walls / obstacles
 - Different protocols (ZigBee / Bluetooth / Simple / etc)



Communication is Paramount!



RF and Bluetooth can interface with
SGD-(Speech Generating Device)



Computer Access



Mouse Emulation



The Power Chair gives Independent access to the Environment...

The USB Mouse Gives Independent Access to the Rest of the World...



- Allows the Driver control to act as (emulate) a PC mouse
- Compatible with PC or MAC Computers
- Compatible with Augmentative Communication Devices (AAC)
- Included Standard with the IR Module
- Use with On Screen Keyboard for Access



Mouse Clicks



MK6i:

- Dedicated External switches
- Dedicated Driver Control Commands



R-net:

- left and right directional switches, quick hit

Q-Logic:

- left directional switch = left click, double hit = double click
- Right directional switch = right click
- External switch via additional "Run Plug"

How does Mouse Emulation work?

- Plug in the Dongle to the USB Port
 - Looks like a simple Flash Drive
- Program "Mouse On" in <Performance Adjustment> Menu
 - Choose 3 quadrant for RIM drivers
 - Choose 4 quadrant for Joystick drivers
- To operate mouse w/ the driver control, simply choose the Mouse Icon on the Display

The Driver Control will now move the cursor



Mouse Emulation 4-Quadrant Mode

- Proportional Joystick will move the mouse in any direction.
- Mouse Click can be done using:
 - Stereo switch - Left & Right click function
 - Mono Switch – Left click only
 - Dwell "Software" installed on PC (users with no switch access)



Mono Switch



Stereo Switch

Mouse Emulation 3-Quadrant Mode

Drivers using RIM (3 quadrant) driving

- Right Command = Cursor movement toggles: Left / Right
- Forward Command = Cursor movement toggles: Up / Down
- Left Command = Mouse click / Double Click / Mouse Latch
- (Mouse Latch = pressing & holding left mouse button)



Infrared Module AND *RF* Mouse Emulation

1. Infrared Module

2. Computer Input for Mouse Control

IR Transmitter

Stereo Switch

46

Access!

Yes, you can.

- TV Enhanced
- TV Basic
- DVD / VCR
- Cable Satellite
- Audio / Stereo
- X-10
- IR Phone

Ablenet Prism D Phone

X-10 Control

Yes, you can.

- Allows on/off control of lights and appliances, also control of thermostats, electric beds, door openers and more
- MK6 & Q-Logic only send IR for X-10, so an X10/IR Converter is required, in addition to modules
 - (Smarthome #4040, \$30. www.smarthome.com)

Environment: X-10 Control



- On/off
- Lights and Appliances
- Thermostats
- Electric beds
- Door Openers...
- MK6i and Q-logic only send IR for X-10 so an X-10/IR converter is required in addition to modules
- www.smarthome.com #4040, \$30.00

IR Operation



Drivers using 4 quadrant mode

- **Right Command:** Scrolls right through menu options
- **Left Command:** Scrolls left through menu options
- **Forward Command:** Selects icon / feature

Infrared Module
OFF
3 Quadrant
→ 4 Quadrant



IR Operation



Drivers using 4 quadrant mode

- **Right Command:** Scrolls right through menu options
- **Left Command:** Scrolls left through menu options
- **Forward Command:** Selects icon / feature

Infrared Module
OFF
3 Quadrant
→ 4 Quadrant



IR Operation



- Drivers using RIM (3 quadrant) driving
 - **Right Command:** Scrolls right through menu options
 - **Left Command:** Selects icon / feature
 - **Forward Command:** Does Nothing. Allows use as a head rest

Allows users to remain tilted & change the channel, answer the phone, etc...



Infrared Module
OFF
→ 3 Quadrant
4 Quadrant

Hardware: SD (memory) Cards



Part# 1144015

Basic

- Comes with **EVERY** chair w/ Rehab Driver Controls.
- Use to back up / Restore **only One System**
- Leave behind with user or store in providers files

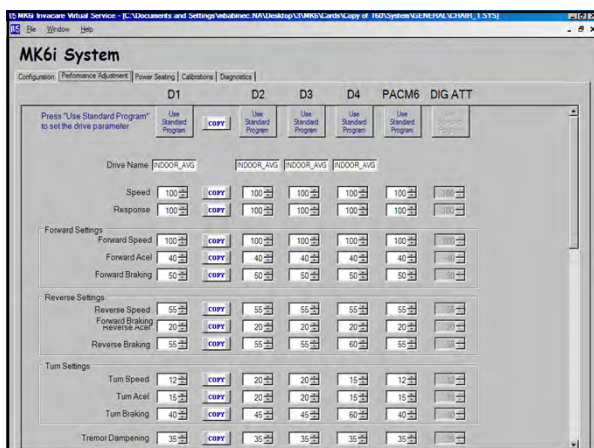



Part# 1144016

Professional

- Provides benefits of LapTop IVS – AND MORE – In the Palm of Your Hand!
- Diagnostics / Help Screens / Trouble-Shooting Tips
- Create Libraries of Ready to Install Custom Programs
- Download software upgrades from www.invacare.com
- Install software upgrades on chairs

53





Know the Goals...
Make it Happen!

2012 Invacare CARES Education
